# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-026312
(43)Date of publication of application : 27.01.1998

(51)Int.CI. F23D 11/12

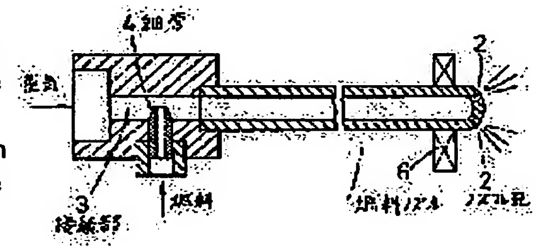
(21)Application number : 08-201277
(22)Date of filing : 10.07.1996

(71)Applicant : OSAKA GAS CO LTD
SUNRAY REINETSU CO LTD

(72)Inventor : TATSUTA KOJI
ICHIKI KOICHI
DEGUCHI MASAKAZU

## (54) ATOMIZATION TYPE BURNER

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the cost of an atomization type burner.
SOLUTION: In an atomization type burner of which a fuel nozzle 1 is constructed of a single-wall tube and wherein liquid fuel supplied, with pressurized gas, to the base end part of this single-wall tube 1 is atomized in the tube and jetted from a fore-end nozzle hole 2, the single-wall tube 1 is made 50cm or more long and also the flow rate in the tube is made 30m/sec or above. Accordingly, the structure of the fuel nozzle of an intramixing type burner of a large capacity which have necessitated a double-wall tube in the prior arts can be simplified.





LEGAL STATUS
[Date of request for examination]
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－26312

(43)公開日　平成10年(1998) 1月27日

| (51)Int.Cl.⁶ | 識別記号 | 庁内整理番号 | ＦＩ | 技術表示箇所 |
|---|---|---|---|---|
| Ｆ２３Ｄ　11/12 | | | Ｆ２３Ｄ　11/12 | |

審査請求　未請求　請求項の数１　ＦＤ　（全 ４ 頁）

(21)出願番号　特願平8－201277

(22)出願日　平成８年(1996) ７月10日

(71)出願人　000000284
大阪瓦斯株式会社
大阪府大阪市中央区平野町四丁目１番２号

(71)出願人　000106597
サンレー冷熱株式会社
大阪府枚方市招提田近３丁目25番地

(72)発明者　竜田　孝司
大阪市中央区平野町四丁目１番２号　大阪瓦斯株式会社内

(72)発明者　市来　広一
大阪市中央区平野町四丁目１番２号　大阪瓦斯株式会社内

(74)代理人　弁理士　鱒　浩介

最終頁に続く

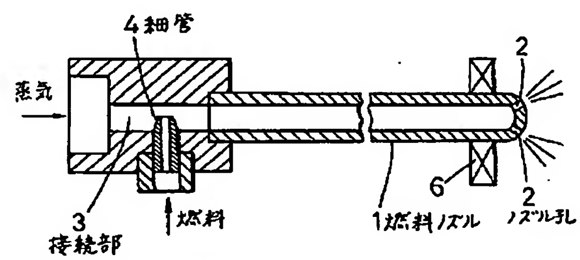
(54)【発明の名称】　アトマイズ型バーナ

(57)【要約】

【目的】　アトマイズ型バーナのコストダウンを図る。

【構成】　燃料ノズル１を一重管で構成し、この一重管１の基端部に加圧気体と共に供給した液体燃料を管内で霧化して、先端ノズル孔２から噴出させるようにしたアトマイズ型バーナにおいて、一重管１の長さを５０ｃｍ以上とすると共に、管内流速を３０ｍ／秒以上とした。

【効果】　従来二重管を必要とした大能力の内部混合形バーナの燃料ノズルの構造を簡略化することができた。



1

【特許請求の範囲】

【請求項１】　燃料ノズルを一重管で構成し、該一重管の基端部に加圧気体と共に供給した液体燃料を管内で霧化して、先端ノズル孔から噴出させるようにしたアトマイズ型バーナにおいて、上記一重管の燃料供給部からノズル孔までの長さを５０ｃｍ以上とすると共に、管内流速を３０ｍ／秒以上としたことを特徴とするアトマイズ型バーナ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、高圧の空気又は蒸気により液体燃料を霧化して噴出させる内部混合式のアトマイズ型バーナに関するものである。

【０００２】

【従来の技術】この種のアトマイズ型バーナは、図１に示すように、燃料ノズル１の基端部に液体燃料と共に加圧した空気又は蒸気を供給して、先端付近に設けられている混合室７内で液体霧化し、これを先端ノズル孔２から噴出させている。このように混合室７をノズル１の先端付近に設けている理由は、混合室７が長くなると一旦霧化した液体燃料の微粒同士が再凝集して大きくなってしまい、空気との接触面積が減少して燃焼性が悪化するからである。

【０００３】しかし一方、燃料ノズル１は燃焼用空気を供給するためのウインドボックス（風箱）８の中心部に貫設され、このウインドボックス８には通常炉壁に装着するための筒部とフランジ部が形成されるために、燃料ノズル１としては例えば全長１．５～２．０ｍ程度の長いものが要求されることが多い。従って従来は、図１に示すように、燃料ノズル１を二重管１ａ及び１ｂで構成し、先端の混合室７までは加圧気体と液体燃料を別個に供給して、混合後は直ちにノズル孔２から噴出させるようにしていた。

【０００４】

【発明が解決しようとする課題】しかしながら上述の従来方式においては、一般に燃料ノズル１の構造が複雑である上に、液体燃料を加圧するための油ポンプも必要であり、気体燃料を用いるバーナに比し、著しくコスト高になるという欠点があった。また小型で能力の小さいバーナでは、図４に示すような一重管式ノズルも試みられているが、この方式を大型のバーナに採用しようとすると、図６の測定結果Ｂに示すように、管長が大きくなるに従って、ノズルから噴出する霧化微粒の粒径が急激に増加し、燃焼性が悪くなって、火炎が長くなったり、すすや一酸化炭素を発生し易くなるという問題があった。本発明はかかる問題点に鑑み、例えば１００万ｋｃａｌ／ｈ程度の大能力バーナにおいても、燃料ノズル１の構造を簡略化して大幅なコストダウンを図ることができるようなこの種のアトマイズ型バーナを提供することを目的とするものである。

2

【０００５】

【課題を解決するための手段】本発明によるアトマイズ型バーナは、図２に示すように、燃料ノズル１を一重管で構成し、この一重管１の基端部に加圧気体と共に供給した液体燃料を管内で霧化して、先端ノズル孔２から噴出させるようにしたアトマイズ型バーナにおいて、一重管１の長さを５０ｃｍ以上とすると共に、管内流速を３０ｍ／秒以上としたものである。このように管内流速を大きくするには、管径を細くすると共に管の断面積に対する先端ノズル孔の総面積の比を大きくし、更にノズル基端部の加圧気体接続部３の面積を大きくすればよく、例えば管径４ｍｍで９０～１００ｍ／秒程度の流速を容易に実現できる。

【０００６】

【作用】上述のように管内流速を大きくするとことによって、霧化微粒の粒径を小さくすることができる理由は、次のように考えられる。すなわち霧化微粒同士の再凝集は、空中では気流に妨げられて殆ど行われず、大部分が管壁で行われている。従って管内の流速を大きくして、霧化微粒が管壁に付着してから剥離するまでの時間を短くすれば、微粒同士の再凝集の機会が減少して、管の長さにかかわりなく霧化初期の粒径を維持することができるのである。

【０００７】

【発明の実施の形態】図１及び２は本発明によるアトマイズ型バーナの一実施例を示したもので、燃料ノズル１は一重管で構成されており、一重管１の基端部には、図４の従来例に比し断面積が十分大きく、従って圧力損失が少ない接続部３を介して蒸気（又は空気）供給管が接続され、更に基端部付近の管壁より液体燃料注入用の細管４が突設されている。液体燃料は流速の大きい蒸気流による霧吹き効果によって、管内に吸引されて霧化し、ノズル孔２から噴出する。燃料ノズル１の外周には、二次空気供給筒５が同心状に設けられており、この空気流がノズル１の先端近くから周囲に張り出された保炎用のスワール板６によって旋回攪拌されたのち、上記霧化燃料と混合してこれを燃焼させる。

【０００８】

【実施例】燃料ノズルを内径４ｍｍ，長さ１ｍの一重管で構成し、先端ノズル孔を１．５ｍｍ×４個として、加圧気体を圧力４ｋｇ／ｃｍ$^2$ Ｇの空気４ｍ$^3$ ／時（見かけの流速２０ｍ$^3$ ／時），液体燃料を灯油２０リットル／時としたところ、空気流速は８８ｍ／秒となり、ノズル孔から噴射された霧化燃料の平均粒径は約５０μｍ（管長を０とした場合とほぼ同じ）であった。なおノズル基端部の接続部の口径は管径と同じとし、液体燃料はポンプで加圧供給し、液体燃料供給口（細管）を内壁面から突出させなかった。

【０００９】図５は管の内径のみを変化させ、その他の条件は上記実施例と同様にして、内径（又は管内流速）

とノズル孔から噴射される微粒の粒径の変化を測定した結果を示したものである。流速約３０ｍ／秒を境にして、噴射微粒の粒径が急激に増加している。なお内径１２ｍｍ以上（流速１０ｍ／秒以下）で粒径が飽和しているのは、粒径が大きくなると、流速が遅くても剥離が生じ易くなるためと考えられる。

【００１０】次に図６は、内径１０ｍｍのノズルＡ（図４の従来タイプ）と、内径４ｍｍのノズルＢ（上記実施例タイプ）について、管長のみを変化させた場合の噴射微粒の粒径を測定した結果を示したものである。本発明品Ａでは管長に殆ど影響されることなく、霧化初期の粒径（５０μｍ）が維持されている。

【発明の効果】本発明は上述のように、霧化微粒の再凝集が主として管壁で行われる点に着目して、加圧気体の管内流速を大きくし、霧化微粒が管壁に付着している時間を短くして、微粒同士の再凝集を妨げるようにしたものであり、それによって従来二重管の複雑な構造によらなければ実現できなかった大能力のアトマイズ型バーナの燃料ノズルを、きわめて簡単な一重管構造で実現することができ、大幅なコストダウンが可能となる。また液＊

＊体燃料の供給も従来の内部混合形のようにノズル先端まで圧送する必要がないので、気流の運動エネルギによって霧化する気流噴霧方式が採用でき、油ポンプを省略することができる。

【図面の簡単な説明】

【図１】本発明及び従来例に共通の全体断面図。

【図２】本発明に用いる燃料ノズルの縦断面図。

【図３】燃料ノズルの従来例を示す縦断面図。

【図４】燃料ノズルの他の従来例を示す縦断面図。

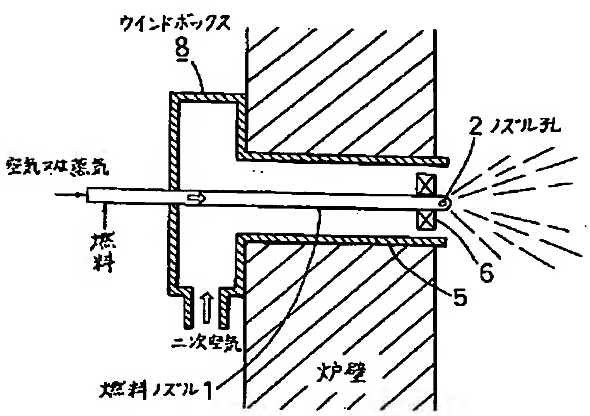
【図５】本発明の動作原理を示す測定データのグラフ。

【図６】本発明品と従来例の比較データのグラフ。

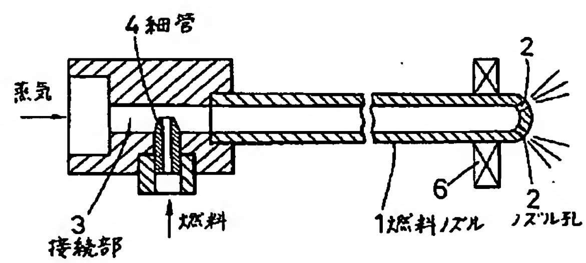
【符号の説明】

1　燃料ノズル
2　ノズル孔
3　接続口
4　蒸気供給管
5　細管
6　燃焼空気供給管
7　混合室
8　ウインドボックス

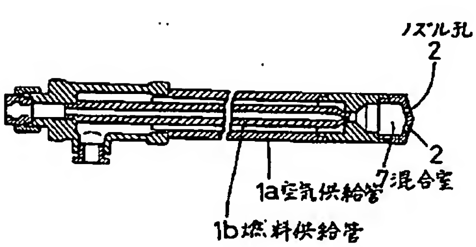
【図１】



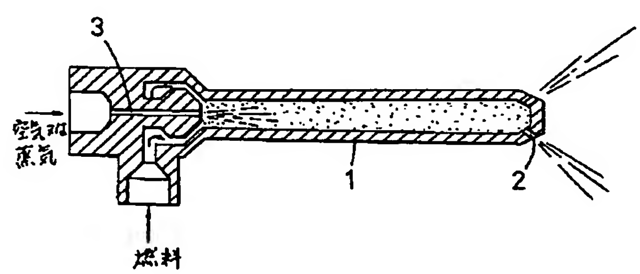

【図２】



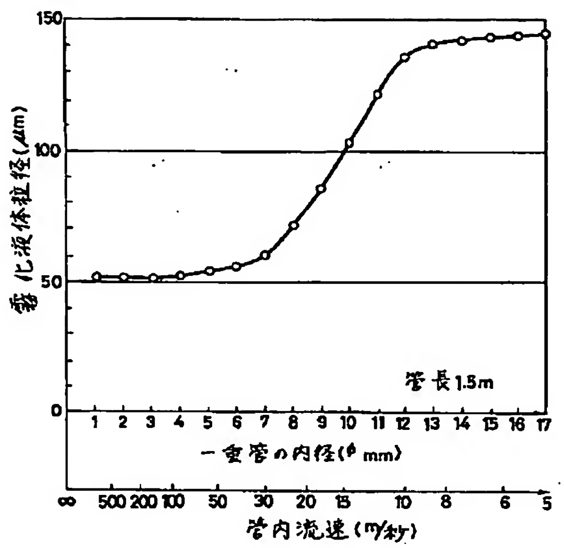

【図３】



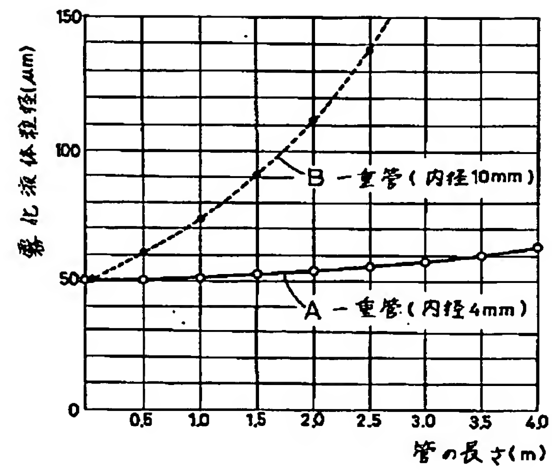

【図４】



【図５】




【図６】




フロントページの続き

(72)発明者　出口　雅一
大阪府枚方市招堤田近３丁目25番地　サンレー冷熱株式会社内

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-026312

(43)Date of publication of application : 27.01.1998

(51)Int.Cl. F23D 11/12

(21)Application number : 08-201277

(22)Date of filing : 10.07.1996

(71)Applicant : OSAKA GAS CO LTD
SUNRAY REINETSU CO LTD

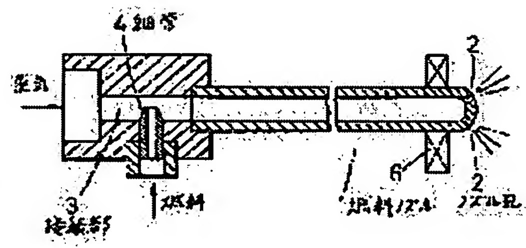
(72)Inventor : TATSUTA KOJI
ICHIKI KOICHI
DEGUCHI MASAKAZU

## (54) ATOMIZATION TYPE BURNER

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the cost of an atomization type burner.

SOLUTION: In an atomization type burner of which a fuel nozzle 1 is constructed of a single-wall tube and wherein liquid fuel supplied, with pressurized gas, to the base end part of this single-wall tube 1 is atomized in the tube and jetted from a fore-end nozzle hole 2, the single-wall tube 1 is made 50cm or more long and also the flow rate in the tube is made 30m/sec or above. Accordingly, the structure of the fuel nozzle of an intramixing type burner of a large capacity which have necessitated a double-wall tube in the prior arts can be simplified.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

---

CLAIMS

---

[Claim(s)]
[Claim 1] The atomization mold burner characterized by having constituted the fuel nozzle from single tubing, having atomized within tubing the liquid fuel supplied to the end face section of this single tubing with the pressurization gas, and carrying out the rate of flow in tubing in 30m/second or more while setting die length from the fuel feed zone of the above-mentioned single tubing to a nozzle hole to 50cm or more in the atomization mold burner it was made to make blow off from a tip nozzle hole.

---

[Translation done.]

* NOTICES *



---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the atomization mold burner of the internal mixing type which atomizes liquid fuel with high-pressure air or a high-pressure steam, and is made to blow off.
[0002]
[Description of the Prior Art] This kind of atomization mold burner supplies the air or the steam which pressurized the end face section of a fuel nozzle 1 with liquid fuel, carries out liquid atomization in the mixing chamber 7 prepared near the tip, and is making this blow off from the tip nozzle hole 2, as shown in drawing 1 . Thus, the reason for having formed the mixing chamber 7 near the tip of a nozzle 1 is that the particles of the once atomized liquid fuel will re-condense, it will become large, a touch area with air will decrease, and flammability will get worse if a mixing chamber 7 becomes long.
[0003] However, on the other hand, a fuel nozzle 1 is installed through the core of the wind box (wind box) 8 for supplying a combustion air, and since the cylinder part and flange for usually equipping a furnace wall are formed in this wind box 8, as a fuel nozzle 1, an about [ overall-length 1.5-2.0m ] long thing is required in many cases. Therefore, a fuel nozzle 1 is constituted from double pipes 1a and 1b, and he supplies a pressurization gas and liquid fuel separately, and was trying to make after mixing blow off from the nozzle hole 2 immediately up to the mixing chamber 7 at a tip conventionally, as shown in drawing 1 .
[0004]
[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional method, generally an oil pump for the structure of a fuel nozzle 1 to pressurize liquid fuel in a complicated top is also required, it compared with the burner using gaseous fuel, and there was a fault of becoming cost quantity remarkably. Moreover, there was a problem of the particle size of the atomization particle spouted from a nozzle as it is shown in the measurement result B of drawing 6 and a tube length becomes large, when it is going to adopt this method as a large-sized burner, although the single tubing type nozzle as it is small and shown in drawing 4 by the burner small [ of capacity ] is also tried increase rapidly, and flammability worsen, and a flame having become long or become easy to generate soot and a carbon monoxide. This invention aims at offering this kind that simplifies the structure of a fuel nozzle 1 and can aim at a large cost cut also in 1 million kcal/about h Hiroyoshi force burner of atomization mold burner in view of this trouble.
[0005]
[Means for Solving the Problem] As shown in drawing 2 , the atomization mold burner by this invention constitutes a fuel nozzle 1 from single tubing, atomizes within tubing the liquid fuel supplied to the end face section of this single tubing 1 with the pressurization gas, and it carries out the rate of flow in tubing in 30m/second or more in the atomization mold burner it was made to make blow off from the tip nozzle hole 2 while it sets the die length of the single tubing 1 to 50cm or more. Thus, in order to enlarge the rate of flow in tubing, the about 90-100m [/second ] rate of flow is [ that what is necessary is to enlarge the ratio of the gross area of a tip nozzle hole to the cross section of tubing while making a tube diameter thin, and just to enlarge area of the pressurization gas connection 3 of the nozzle end face section further ] easily realizable by 4mm of tube diameters.

[0006]
[Function] The reason which can make particle size of a atomization particle small by things if the rate of flow in tubing is enlarged as mentioned above is considered as follows. That is, re-condensation of atomization particles is barred by the air current in the air, and is hardly performed, but most is performed by the tube wall. Therefore, if the rate of flow in tubing is enlarged and time amount after a atomization particle adheres to a tube wall until it exfoliates is shortened, the opportunity of re-condensation of particles can decrease and the particle size in early stages of atomization can be maintained without relation to the die length of tubing.
[0007]
[Embodiment of the Invention] Drawing 1 and 2 are what showed one example of the atomization mold burner by this invention, and the fuel nozzle 1 consists of single tubing. In the end face section of the single tubing 1 It compares with the conventional example of drawing 4 R> 4, and sufficiently greatly [ the cross section ] therefore, a steamy (or air) supply pipe is connected through the connection 3 with little pressure loss, and the capillary 4 for liquid fuel impregnation protrudes from the tube wall near the end face section further. According to the atomizer effectiveness by the large steamy style of the rate of flow, liquid fuel is attracted in tubing, is atomized, and is spouted from the nozzle hole 2. The secondary air supply cylinder 5 is concentrically formed in the periphery of a fuel nozzle 1, after revolution churning is carried out with the swirl plate 6 for flame stabilizing with which this airstream was jutted out over the perimeter near the tip of a nozzle 1, it mixes with the above-mentioned atomization fuel, and this is burned.
[0008]
[Example] Constitute a fuel nozzle from single tubing with a bore [ of 4mm ], and a die length of 1m, and a tip nozzle hole is made into 1.5mmx4 piece. A pressurization gas the pressure of 4kg/cm2 At the time of 4m3 of air/of G (at the time of apparent 20m3 of rates of flow/) When liquid fuel was used as 20l. [/o'clock ] kerosene, the mean particle diameter of the atomization fuel which the air rate of flow became a second in 88m /, and was injected from the nozzle hole was about 50 micrometers (it is almost the same as the case where a tube length is set to 0). In addition, the aperture of the connection of the nozzle end face section presupposes that it is the same as a tube diameter, and liquid fuel carried out pressurization supply with the pump, and did not make a liquid fuel feed hopper (capillary) project from an internal surface.
[0009] Drawing 5 changes only the bore of tubing and other conditions show the result of having measured change of a bore (or the rate of flow in tubing), and the particle size of the particle injected from a nozzle hole like the above-mentioned example. The particle size of an injection particle is increasing rapidly bordering on about 30m [/second ] rate of flow. In addition, if particle size becomes large, it will be thought of to become easy to produce exfoliation that particle size is saturated with the bore of 12mm or more (the rate of flow 10m [/second ] or less) even if the rate of flow is slow.
[0010] Next, drawing 6 shows the result of having measured the particle size of the injection particle at the time of changing only a tube length about the nozzle A with a bore of 10mm (the conventional type of drawing 4 R> 4), and the nozzle B with a bore of 4mm (the above-mentioned example type). In this invention article A, the particle size (50 micrometers) in early stages of atomization is maintained, without almost being influenced by the tube length.
[Effect of the Invention] This invention notes the point that re-condensation of a atomization particle is mainly performed by the tube wall, as mentioned above. Enlarge the rate of flow in tubing of a pressurization gas, and time amount in which the atomization particle has adhered to the tube wall is shortened. Re-condensation of particles is barred, the fuel nozzle of the atomization mold burner of the Hiroyoshi force which was not able to be realized if it did not twist in the complicated structure of a double pipe conventionally can be realized with very easy single tubing structure, and a large cost cut is attained. Moreover, since it is not necessary to also feed supply of liquid fuel to a nozzle tip like the conventional internal mixed form, the air-current spraying method atomized by the kinetic energy of an air current can be adopted, and an oil pump can be omitted.

---

[Translation done.]

* NOTICES *



---

## DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]
[Drawing 1] This invention and a whole sectional view common to the conventional example.
[Drawing 2] Drawing of longitudinal section of a fuel nozzle used for this invention.
[Drawing 3] Drawing of longitudinal section showing the conventional example of a fuel nozzle.
[Drawing 4] Drawing of longitudinal section showing other conventional examples of a fuel nozzle.
[Drawing 5] The graph of the measurement data in which the principle of operation of this invention is shown.
[Drawing 6] The graph of this invention article and the comparison data of the conventional example.
[Description of Notations]
1 Fuel Nozzle
2 Nozzle Hole
3 End Connection
4 Steamy Supply Pipe
5 Capillary
6 Combustion Air Supply Tubing
7 Mixing Chamber
8 Wind Box

---

[Translation done.]

* NOTICES *



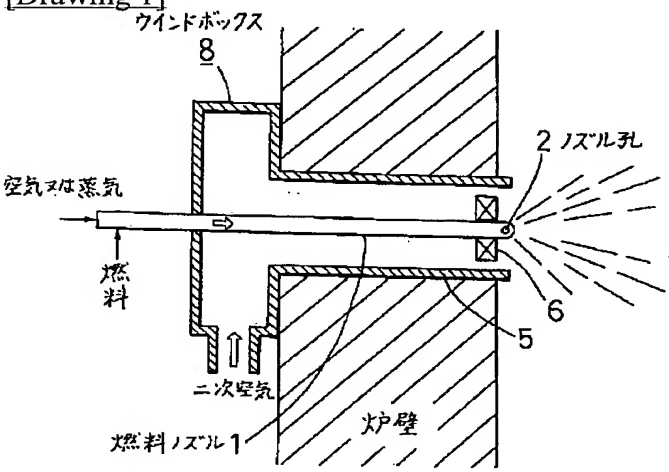
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

---

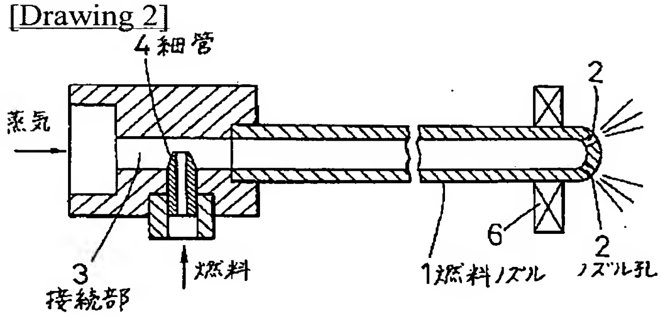
DRAWINGS

---

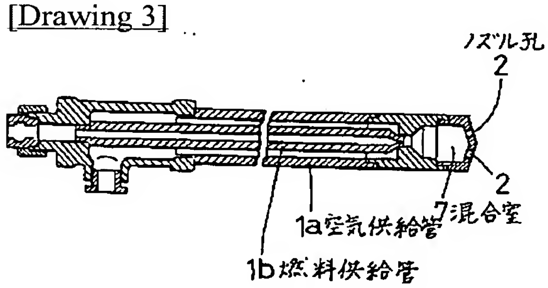
[Drawing 1]



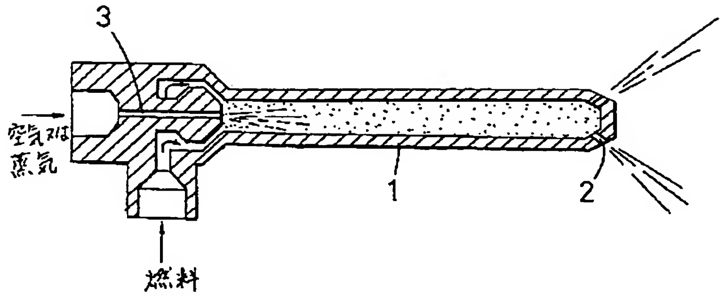

[Drawing 2]



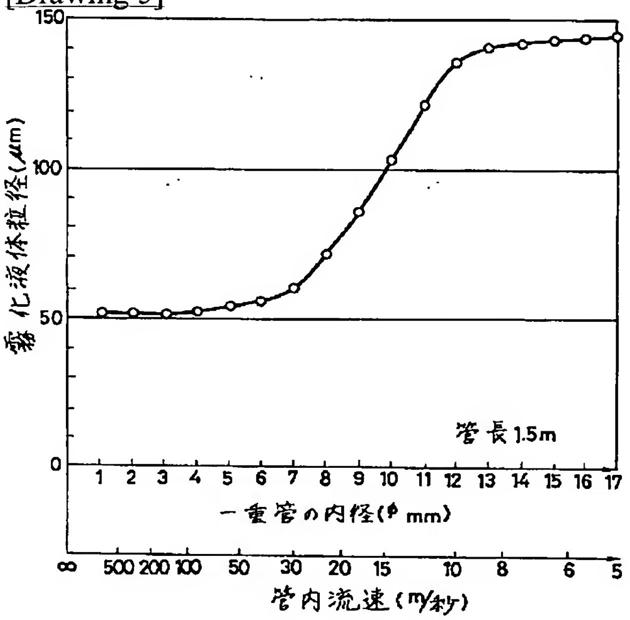

[Drawing 3]



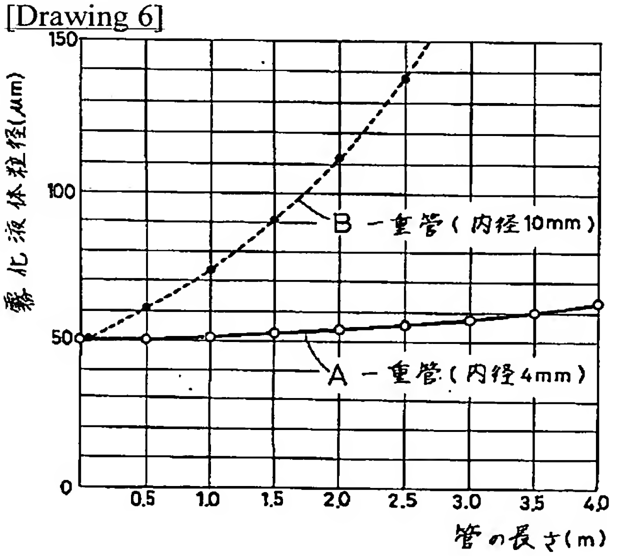

[Drawing 4]




[Drawing 5]




[Drawing 6]




[Translation done.]